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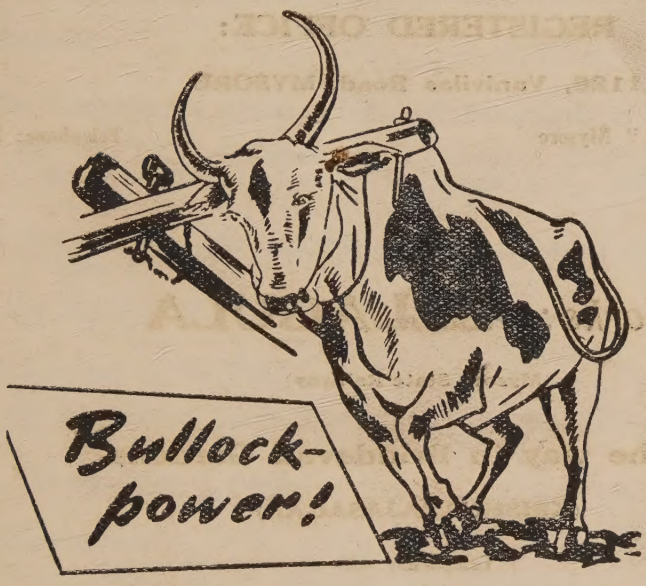

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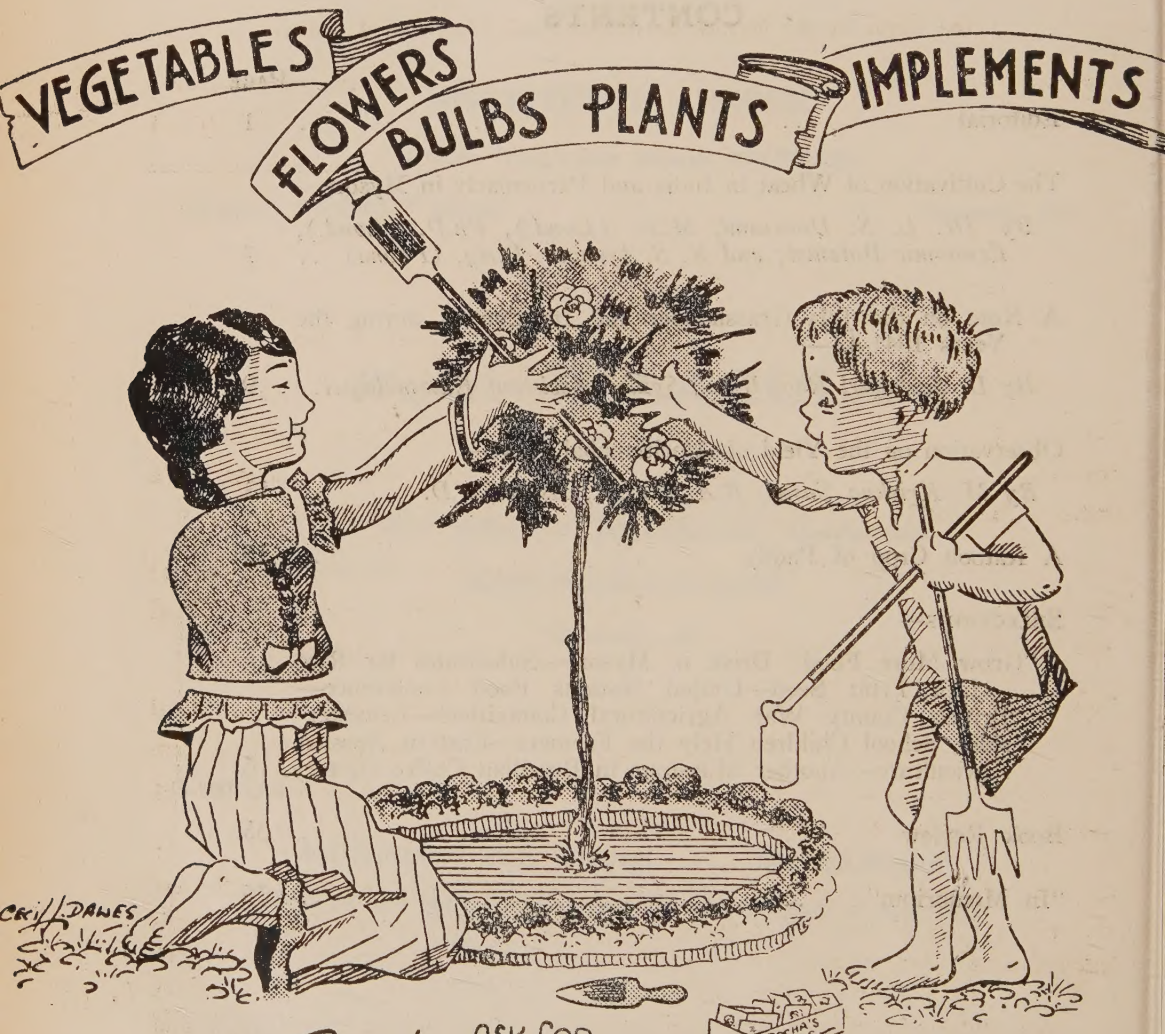

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The Mysore Agricultural Journal

(The Organ of the Mysore Agricultural and Experimental Union)

Vol. XXII] JULY—SEPTEMBER 1943 [No. 1

EDITORIAL

With this issue we enter upon the twenty-second volume of our *Journal.*

The food problem has assumed a serious proportion. The last season was very unfavourable for the crops in the State. Our staple crop Ragi suffered enormously. The prospects in the current season do not look any better. We have already had more rains than anticipated throughout the State.

The general tenor of the raiyats is one of expectancy and anxiety. General scarcity of food, increased costs of cultivation and a desire to profit in view of the high cost of primary products, have contributed to the uneasiness.

Meanwhile 'control', rationing and fixation of prices form the practical economy of food supply. Government have periodically offered both long-term and other concessions with regard to land, seed, manure and cash loans, thereby giving an impetus to "Grow More Food".

Several schools of thought are concentrating on this problem to alleviate the serious food-situation and their deliberations and efforts are bound to have an effect on Agriculture.

We thank our contributors and members but for whose co-operation and kindness this *Journal* could not have been accomplished its work during the past year.

The Cultivation of Wheat in India and Particularly in Mysore

BY

Dr. L. S. Dorasami, M.Sc. (Lond.), Ph.D. (Lond.)

AND

R. S. Iyengar, B.Ag. (Poona)

Cultivation of wheat is pre-historic in old world. De'Candolle believes that the cultivation of this cereal in the temperate parts of Europe, Asia and Africa is older than the most ancient languages known. India ranks fourth amongst the wheat-producing countries of the world. The world acreage of wheat is approximately 300 million acres of which United States of America contributes 57½ million acres, China 46 million acres, Russia 43 million acres and India 29½ million acres. Canada takes up 22 million acres and the rest of the acreage is distributed amongst Spain, France, Italy, Argentine, Turkey and other countries.

Wheat, which is by far the most important food crop in the world, occupies third rank in the dietary of India, being next in order to Rice and Jowar. Of the total area more than 75 per cent. is situated in the alluvial plains of Northern India.

Much of the wheat area lies in the Indo-Gangetic plains, being grown either as an irrigated or a semi-irrigated crop. Punjab, followed by United Provinces, has the largest acreage. Next in importance is Bombay. Amongst the Indian States, Gwalior, Rajputana and Punjab States have large areas. In the south, Hyderabad State has an appreciable acreage. The acreage in Madras and Mysore is too small to be mentioned or to find a place in the trade figures.

In Mysore the area under wheat has been fluctuating between 5,765 acres in 1922-23 to 2,012 acres in 1934-35. The variations in acreage from year to year are due mostly to rainfall and price of wheat. Good rainfall in September-October results in an increase of acreage. High prices as in 1916 to 1925 saw the rise in acreage from 3,500 to 5,700 acres. Low prices of the last decade brought in a reduction in the acreage from 3,000 to 2,000.

The highest acreage in the State is 5,765 acres. The largest area cultivated under this are in the districts of Kadur, Shimoga and Chitaldrug, occupying 90 per cent. of the total acreage. Despite the knowledge that the total acreage is dwindling, it does not minimise the facts of the scope for extension of cultivation of wheat and the dependence of the State on external areas for its normal wheat consumption. The difficulties to secure the normal imports under the present emergent condition should help to increase the area under this. There is no dearth for land under irrigation, nor is there any difficulty to grow it under semi-dry conditions. An average of 4 lakhs of railway maunds of wheat and 1.25 lakhs of railway maunds of wheat-flour are imported annually. The export figures against this run only into 3-4 thousand railway maunds of wheat-flour.

Taking the yield of wheat per acre to be on an average 5.5 railway maunds an area of 1-1½ lakhs of acres would be required to meet the demands of the State. There is ample scope for the extension of the area, provided there is regular control of the price of wheat. Areas situated in the North-Western Bababudan range, comprising mostly black, medium-black and chocolate coloured soils are admirably suited for the cultivation of this cereal. Many of the areas are irrigable, by tanks or wells and the climatic conditions in this region are fairly conducive. The new irrigated tracts offer good scope also. Unless sufficient protection is offered and remunerative prices guaranteed, it would be difficult for our ryots to compete with North Indian cultivators, who are not only blessed with a perennial supply o water and an excellent climatic condition but a rich self-manured soil. The lower trend in the ecreage is perhaps due to this also. Unless precautionary measures are promptly undertaken, it is quite likely that wheat cultivation will become extinct in the State.

Out of the 2,000 and odd acres, Chitaldrug and Kadur command the highest acreage. The area in Kadur has been fairly constant since 1916. Chitaldrug shows a steady decline and in Shimoga the area is deplorably low. In Chitaldrug district, the taluks of Chitaldrug and Hiriyur grow the largest area. At one time these two taluks grew on an average 1,000 acres, but at present it is limited to 400-450 acres per taluk. In the district of Kadur, Kadur taluk grows 90 per cent. of the total district acreage.

Climate and Rainfall.—Wheat is a cold season crop. It requires a comparatively falling temperature during periods of growth and a raising temperature as the crop reaches maturity. It prefers a mean daily temperature of 70° at sowing time. Indian wheats connot withstand much lower temperatures.

In the wheat-growing districts of Mysore the mean daily temperature during the vegetative period is on the average 60° F., whilst the mean daily temperature during the fruiting stage is 80-85° F. In the State higher temperatures set in too early. Many a year the early part of February is very warm and the wheat crop is forced to ripen earlier than it ought to, with the consequence that the growth period is restricted and reduced and the returns are low. Attempts to sow the crop earlier in late September or early October with a view to give the maximum time for growth have been frustrated. The rainfall in September and October is so heavy that the sowings have to be postponed till the cessation of rains, which means late October or early November. Thus the wheat crop will barely have 3-3½ months.

For a successful growth of wheat, soil, and measures to conserve soil moisture, are limiting factors. Rainfall prior to growth rather than during the vegetative period is an important factor. Rainy weather during sowing will delay operations. Squally climatic conditions during ripening stage are detrimental as these conditions encourage rust disease. Dew-fall is most helpful. Prevalence of excessive hot winds during the ripening stage tend to mature the crop earlier and as it often happens, tend to shrivel up the whole plant.

Soil.—The crop is raised on a variety of soils. As a *dry crop* it is grown on blackest or black-cotton soil (ಎರೆಭೂಮಿ) since these retain moisture for a length of time. Such soils are abundant in the district of Chitaldrug.

As a *semi-irrigated* crop it is grown on a clayey loam or in loamy soils. found under tanks and valleys. Kadur, Hassan and parts of Chitaldrug districts possess such soils. As an irrigated crop it is grown on sandy loam to loam or even clayey loam depending on the mode of irrigation. Under light irrigation the soil is usually clayey loam. Tank or canal irrigation, the soil is sandy loam to loam.

Irrigation.—In the districts of Kadur and Chitaldrug which are the most important districts in which wheat is grown appreciably. It is found that 90 per cent. of the area in Kadur district comes under irrigation whilst 35-40 per cent. in Chitaldrug area are under the same category. Irrigation in all these cases is mostly from wells and tanks. A small portion is under canal irrigation. The wheat grown under well irrigation thrives much better than under tank or canal irrigation. It is presumed that well water contains more of soluble nitrates. Irrigation by tanks or canal is rapid. The rush of water is analogous to a heavy and sudden downpour. The surface gets heavily packed with soil and aeration is hampered. This is more common on heavy soils since the rate of flow of irrigation does not affect in sandy or sandy loam soils. In Mysore nearly 75,000 acres come under well irrigation. (Bangalore 15,000 to 16,000, Kolar 26,000, Tumkur 23,000-29,000, Chitaldrug 15,000-16,000). In these regions wheat cultivation can be successfully introduced.

Cultivation.—Wheat is cultivated either as a dry or an irrigated crop. The method of dry cultivation is primarily based on the conservation of soil moisture and extensive cultivation. Irrigated cultivation is based on good drainage and intensive cultivation. In Mysore more than two-thirds of the wheat is irrigated and dry cultivation is getting scarce.

Preparation of Land.—As wheat is essentially a winter crop, cultivation for a dry crop commences in April. The land meant for wheat is kept uncropped during the autumn and is harrowed twice every month and this is repeated month after month until the crop is sown in October. Ploughing the land is rarely done, for the soil in which a dry crop of wheat is taken is a heavy black soil which is supposed to plough itself. The black soils crack during the summer months to such an extent that the whole field would be a network or mosaic of cracks. After the first shower in April or May the baked and weathered surface soil is turned in with the help of a blade harrow. The cracks are all filled up and this operation is known as scarifying. Scarifying or harrowing is repeated as often as time permits and after heavy shower, till the crop is sown. Repeated harrowing prevents cracking and loss of moisture and eradication of weeds. Further the tilth of the soil is rendered loose and friable creating an absorptive surface for the rain water. The soil thus rendered loose and friable does not let the rain water as a run-off. If the land is slopy bunds of sufficient height are laid across the slope so that no erosion of the soil occurs and to assist in the conservation of moisture. It is customary to work a plank harrow a few days before sowing, so that the clods are broken, land levelled and the soil properly packed. Wheat requires a firm seed-bed, hence the importance of this operation. If after the plank harrowing there should be a shower, the land is once again worked with a blade harrow followed by a plank harrow. A dry crop of wheat rarely receives any manure.

Whilst the preparation of land for dry crop of wheat starts so early as April or May, preparatory cultivation for an irrigated crop starts just a month or so before sowing. The land meant for wheat sowing is not always kept vacant. Commonly wheat follows a summer groundnut or onion crop. In the month of September the land is ploughed about six times with a country plough. If the ground is hard it is splash- or sparse-irrigated, and when the soil is in an optimum moisture condition the land is then ploughed. Cultivation for an irrigated crop is more intensive. The fields are manured with 10-15 cartloads of manure per acre which is properly incorporated into the soil by working a blade harrow. The land is then levelled with a *halube* and compacted by working a log or plank harrow. Just a day or two before sowing, the field is flooded and when the soil is in ripe condition sowing is taken up.

Sowing.—In dry lands the sowing is in October, *i.e.*, during rains (*Swati*). It may be delayed on account of rain. The seeds are sown with a two-coultered two-feet heavy drill or in plough furrows. The distance between the plough furrows is one foot. Seeds are distributed as uniformly as possible in the plough furrows which are covered by opening another furrow adjacent to the one in which seeds are sown. Thus the soil from the new furrow covers the seeds in the adjacent furrow. In the case of sowing by the two-feet drill, the distance between the rows is reduced to one foot; thus the two-tyned two-feet drill is placed alternatively between the previous rows. Eventually the rows of crops will be one foot apart. Some cultivators use a three-tyned one-foot drill, which is probably best.

Sowing is done deep, to a depth of 1-1½". Seed rate varies. Average is 10-12 seers. Sometimes it goes as high as 20 seers. Seeds are sown with or without husks according to the variety.

In the case of irrigated wheat, seeds are either broadcast or sown in the plough furrow. Drill sowing is not commonly met with. Sowing is done in October as in dry lands or a little later. Seed rate is 25-30 seers. After the seeds are broadcast a blade harrow or *halube* is worked and the seeds are covered. In the case of seeds sown in plough furrows another plough furrows adjacent to the ones in which the seed is sown are opened and the seeds are thus covered. When the seeds are about to germinate, *i.e.*, five or six days, the field is again irrigated. Thereafter the number of irrigation or the frequency is determined according to the condition of the crop and soil. On an average four to five irrigations are given after germination. The interval between irrigations is not more than three weeks. As to the method of irrigation no sooner the seeds are sown and before germination starts, the whole field is laid into suitably sized beds, *i.e.*, 10′ × 10′ or 8′ × 10′ which is done by opening furrows at ten feet apart, and eight to ten feet apart in another way. These plough furrows serve as water channels for irrigating the wheat beds.

In the dry method, wheat is grown as a mixed crop with Bengal-gram and safflower. Safflower is grown as a border crop of three to six rows and Bengal-gram is mixed with wheat and sown. Irrigated wheat is generally taken as a pure crop.

Intercultivation.—In the case of a dry crop it consists in the working of a slit hoe and the entire hoe once or twice. Slit hoes are worked when the

crop is young and thereafter with the entire hoe. The implements are used with the object of conserving moisture by removal of weeds and mulching of the land.

In the case of an irrigated crop hand weeding is often done. Sometimes recourse is had to thinning and filling up gaps. In such cases where the seeds are sown in plough furrows the entire hoe can be worked. This will help in mending the plough furrows and the removal of weeds. If winter rains are heavy, the wheat crop tends to become leafy in which case the crop is grazed or cut back and this helps in getting a better crop.

Maturity or Development.—Wheat on the whole is a poor tillerer. When sown in October, the flowers—earhead—begin to appear in January. The appearance of flower depends on the warm wind prevalent. Six weeks after the appearance of flowers the crop is ready for harvest, *i.e.,* by middle or end of February, thus being five months in duration. If the month of January is cold, flowering appears late in February and the crop matures in March.

Harvest.—Wheat is generally harvested "dead-dry". Harvesting consists in pulling out the plants or cutting the clumps with a saw-edged sickle at ground level. The harvested plants are allowed to remain in the field in an orderly manner for about two days giving a further chance for all plants to dry uniformly. They are then bundled and taken to threshing floor and the grain threshed by bullocks or by beating with sticks or by working with an implement called *Norag.* Threshing by the feet of bullocks is most common. Wheat sheaves are spread on the floor of the threshing yard and are allowed to dry for a few hours, and then three or four pairs of animals are made to trample them, by making the animals go round and round. The grains are not only separated, the straw is converted into short soft chaff which may enhance the value of the fodder. The grain is winnowed, dried and stored.

The grains are stored in underground cellars or *Hagevu* or *Kanaja,* or in special bins with an outlet at the bottom and an inlet at the top. The latter method is in force only with those who have small quantities to store.

Wheat like Jola (sorghum) is attacked by store-pests. To ensure safe preservation wheat is stored in a dry and cool place. In the case of underground pits they are dug in dry grounds and the sides of the pits are rammed. Wheat chaff is lined on the sides and at the bottom. Wheat grains are poured in the centre. The pits are filled to two-thirds or three-fourths their capacity and then the mouth of the pit is closed and plastered with cowdung and clay, These pits are not opened often.

Yield.—The yield of a dry crop is 450 lbs. and that of an irrigated one. 850 lbs Good yields in the case of a dry crop may be as high as 1,000 lbs. and that of the irrigated may go up to 2,000 lbs.

Rotation.—In dry land wheat is rotated with cotton or groundnut or even Bengal-gram. Irrigated wheat is rotated with groundnut, onions or chillies.

Diseases.—Rust on wheat is the most dreaded and deadliest disease. There are three forms of wheat rusts:

Puccinia graminis—Black rust.
Puccinia glumarum—Yellow rust.
Puccinia triticina—Orange rust.

The first is very commonly met with in Mysore. The damage caused varies from 10 to 25 per cent. The conditions that favour the disease are dampness and cloudy weather conditions in January and February. Remedy lies in proper rotation, growing rust-resistant wheats or Spelt types. Smut is another disease that is found on wheat. It is caused by *Ustilago tritici.*

Cost of Cultivation

[*Daily wages*:—Pairs 13 annas, Men 7 annas and Women 4 annas.]

Dry Crop

	Pairs	Men	Women	Amount Rs. A. P.
Clearing the stubbles ..	⅓	⅓	1	0 10 8
Harrowing six times ..	2	2	0	2 8 0
Drilling and covering ..	⅓	1	1	0 15 4
Seed 50 lbs. ..		..	..	2 8 0
Hoeing four times ..	2	4	0	3 6 0
Harvesting	0	0	6	1 8 0
Threshing	2	2	2	3 0 0
		Total ..		14 8 0
Return 450 lbs. of grain @ 12 lbs. per rupee			..	37 8 0
		Net return (app.)	..	23 0 0

Irrigated Crop

Ploughing twice ..	2	2	0	2 8 0
Harrow thrice ..	1	1	0	1 4 0
10 Cartloads of Farmyard Manure (Carting and Spreading) ..	1	2	3	10 4 0
Seed 80 lbs.				4 0 0
Sowing	1	1	0	1 8 0
Division into plots ..	1	1	0	1 4 0
Irrigation six times ..	0	6	0	2 10 0
Weeding	0	0	6	1 8 0
Harvesting	0	0	8	2 0 0
Threshing	3	3	3	4 8 0
		Total ..		31 2 0
Return 850 lbs. @ 12 lbs. per rupee		..	..	70 13 0
		Profit (app.)	..	40 0 0

Deduct from both, assessment at Rs. 1-4-0 for dry lands and Rs. 2-8-0 for irrigated plots.

The returns derived are more than what is shown above. In irrigated plots the actual yields are higher. Profit is commensurate with the ruling

prices. In both cases the labour is from the ryot and his family. As such bulk of his expenses enumerated above go towards his net returns.

Uses of Wheat.—Wheat is commonly used as wheat-flour and made into dry bread (*Bhakri*) or soft bread (*Chapathy*). After micro-fermentation it is also converted into vesicular bread. The bran is one of the chief "offals" of wheat and consists of the outer-layer of the grain. It is the coarsest of all the bran or offals, these comprising in order of the coarseness, bran pollard, sharps and midlings. The bran is used for milch cattle and also horses. Nitrogenous substance contained in the bran is in the form of Gluten. Bran also contains a peculiar kind of mucilage rich in phosphates.

Production and Imports.—The production of wheat in Mysore being very small, large quantities are annually imported. The annual production in Mysore is 600 tons, but the trade in import and export in wheat and wheat-flour comes to 17,000 tons. There is a large surplus of import over export and there is a trend of increase of imports from year to year. The import is from Bombay, Central Provinces and Punjab. The little that is exported is mostly to Madras. During 1939-40, the import was 302,995 railway maunds and State production was 18,000 railway maunds, totalling up to 320,000 railway maunds. Of this 4,800 was exported and the consumption in the State being 315,200 railway maunds. In addition to this the wheat-flour imported in the same year was 190,665 railway maunds, the export being 28,276 railway maunds, thus leaving a balance of 158,000 railway maunds for local consumption. Assuming one railway maund of wheat equals one railway maund of wheat-flour, the State imported 473,200 railway maunds. To produce this quantity at least a minimum of one lakh of acres of land is required. But the trend of consumption of wheat seems to be on the increase. Is it then possible to find adequate acreage to grow enough wheat so as to be self-sufficient? Sources necessary to harness this area are plentiful. This coupled with the introduction of better yielding and disease-resisting strains ought to make Mysore self-sufficient.

A Note on the Jola Grass-hopper (*Colemania sphenarioides*, Bol.) and Its Control during the Years 1941 and 1942

By D. Seshagiri Rao, B.Sc.
(*Senior Assistant Entomologist*)

Introduction

The earliest published records of this pest in Mysore State[1] show that it appeared for the first time in 1909 and "was restricted to the northern parts of Chitaldrug and Shimoga Districts where Mysore State and Bombay and Madras Presidencies meet". The taluks affected were Honnali and Channagiri in Shimoga District and Davangere, Chitaldrug and Jagalur in Chitaldrug District. Outside the State the pest had its extensive distribution in almost all the Deeccan districts of Bombay Presidency and in parts of Bellary District in Madras Presidency.

Coleman[1] and the Entomological staff made intensive observations on the life-history and habits of the pests during 1909 and 1910 and recommended certain control measures, chiefly bagging. The pest did not break out in a serious form from 1912 to 1924.

In 1924[2] it appeared in a severe form in the same localities as during 1909-12. Prompt propaganda and control measures were initiated by the Department and the pest died out as previously, after two or three years. Again there was a serious incidence from 1932 to 1934, in the same areas as before; after an interval of seven or eight years the epidemic started again in 1941 though in a much milder form than in any of the previous periods of incidence.

From the brief account of the history of the Jola grass-hopper pest since 1909, given above, two important facts appear. Firstly, it seems to occur in cycles of about ten or twelve years' length during which it is a major pest for two or three years together, then remaining insignificant for eight or ten years. The reasons for this periodicity are obscure; probably variations in rainfall from year to year may account for this phenomenon. The second factor is the localisation of the pest to definite areas; Coleman[1] attempted to explain the occurrence of the pest in distant localities, as due to the existence of barriers preventing easy movement, and expected it to spread out. But this has not happened so far, the pest remaining localised within its original limits as surveyed during 1909.

Infestation in 1941 and 1942

The range and seriousness of incidence in these seasons was decidedly more restricted and milder than in any bad year previously; 1942 was even a milder season than 1941. The principal affected localities were (1) Davangere and some villages within five miles radius from the town, (2) Pandarahalli and surrounding villages in Chitaldrug taluk, (3) Haralahalli and Sunkadakatte villages in

Honnali taluk, (4) Hireyuda in Channagiri taluk and (5) Uddaghatta in Jagalur taluk. In 1942 the infestation was negligible in Jagalur, Honnali and Channagiri taluks probably because rainfall was low and late in these areas.

Hatching of hoppers began during the middle of July and went on to the middle of August. Exceptionally late hatching in the third week of October was seen in Jagalur taluk in 1941. In addition to the first flush "delayed hatching" in the middle of September occurred at Dodbathi in 1941, so that pre-adult instars were seen in this area as late as the middle of November.

The first batch of adults was seen at the beginning of October; copulation appeared to be definitely over by the first week of November, and egg-laying commenced shortly after.

Bionomical Notes

From a study of soil conditions it is obvious that all kinds of soil in the region are equally prone to attack. Thus of the infested villages listed above, Pandarahalli and neighbouring villages and Hireyuda have red soil, Davangere, Honnali and Jagalur villages have black soil, and Kadajji (Davangere) and Bannikod (Harihar) have sandy soil.

From a detailed survey of infested fields it appears that lands situated on ridges are more liable to attack than low-lying fields. Thus fields adjoining the village-site are free; where only a few fields are infested it is generally those higher in situation than the others. In Dodbathi the final congregation of hoppers was along the railway line which runs on the highest contour in the area.

Hatching of hoppers was mostly on bunds except in a few fields which were badly ploughed and had clods (with egg-clusters unbroken inside presumably) intact from which hatching occurred inside the fields. The hoppers remained on the bunds for about a month after hatching before moving on to the crop. Bunds with long, luscious grass on them harboured naturally more hoppers than those with a poor growth of grass and herbage on them. Similarly in ragi fields, a dense congregation of hoppers was invariably seen in circular patches of luxuriant growth where manure had been dumped before sowing. In groundnut fields hoppers congregated in numbers beneath the leaves, doing but little material damage.

Ryots take two precautionary measures to minimise attack, both of which are sound in principle. One is to alternate Jola with cotton and groundnut which are not materially damaged by the pest, and the other is to sow a smaller seed-rate of jola than normal, and these fields are not so badly attacked as those with denser growth of crop.

At harvest time it was a common sight to see cranes and eagles hovering over fields, catching and swallowing hoppers as they were exposed. An ecto-parasitic red mite was found sticking to the hoppers in some areas, but no hoppers so heavily attacked as to get killed or disabled were seen.

Control Measures

(*a*) *Chemical.*—The chemical, Sodium Silicofluoride, recommended for use against grasshoppers, locusts, Armyworms and such other pests was dusted on a field-scale on bunds in badly infested villages in both the years under review,

with encouraging results. The chemical was mixed with a carrier (rice bran) in the proportion of 1 : 3 and dusted through a thin cloth or a finely perforated tin on badly infested bunds. 48 to 72 hours after treatment, 70 to 80 per cent. reduction in the population of hoppers was seen although dead hoppers were not found in numbers. Vagrant ants were, however, seen carrying them away, though the almost total absence of dead hoppers on treated bunds cannot be due to the scavenging of these ants. It is possible a mass-migration of hoppers also occurs (*vide infra*). As the hoppers remain on bunds for a month, the systematic treatment of all badly infested bunds in any area was seen to exercise effective control of the pest in that area. Rain, when received within two days after dusting, was found to wash away the chemical, and so bulk-treatment could only be done on clear days which held promise of a clear sky for at least two days afterwards.

The quantity of chemical used and the approximate area enclosed by the treated bunds in 1941 and 1942 are given below:—

Season	Quantity of chemical received	Quantity used for dusting	Approximate area	Remarks
1941	448 lbs.	107 lbs. 322 „	..	Preliminary trials.
1942	900 „	650 „	905 acres 450 „	Systematic dusting of all bunds was done and therefore the approximate area covered was smaller than in the previous year.

An interesting and significant result of dusting was that in certain areas dusted in 1941, the pest was not severe in 1942; it may not be that dusting killed all hoppers thereby totally preventing egg-laying, but a movement of hoppers *en masse* from the dusted bunds into distant fields might have occurred. Thus in Yerragunte, initial infestation in 1941 was to the east of the village; later in the season a dense congregation of hopper was noticed in fields south-west of the village. In the next year the eastern section was free but there was a heavy infestation in the south-west. Similarly the Davangere and Pandara-halli fields dusted in 1941 were free in 1942.

Sodium silicofluoride was also used as a poison-bait, mixed with rice bran (in the proportion of 1 : 9 and 1 : 5) and with a little common salt added for taste, and the whole mixture moistened slightly. 19 Pounds of the chemical was used for this purpose in 1941 and 35 pounds in 1942. The bait was spread thinly in Jola fields where a large congregation of hoppers had gathered. On the third day after treatment a considerable reduction of hoppers was found but the jola was slightly scorched. The bait (1 : 5) spread in circular clumps of ragi harbouring large numbers of hoppers killed a large percentage of them. Later when the rain apparently washed off the bait more hoppers were seen to have come into the treated fields and clumps.

(*b*) *Hopper Dozer.*—This bullock-drawn contrivance was worked extensively and some improvement effected to it. The position of the wheels was adjusted so as to give stability to the machine, thereby getting over the need for a man to guide its movement from behind. The grasshopper bags meant to receive the catch, could not be kept open and so allowed a large part of the catch to escape; so they were dispensed with and a zinc sheet tank was fitted up in their place, to be filled with kerosined water. In spite of these improvements the hopper dozer proved to be a cumbersome contrivance damaging the crop to some extent and not efficient enough in its working to warrant its use on an extensive scale.

(*c*) *Bagging.*—Owing to the mild infestation, bagging was not greatly in favour among ryots. The response from village panchayets for owning grasshopper bags to be loaned out to individual ryots was very poor. Departmental bags were given to occasional ryots who put them to good use. The temporary staff were, however, put on intensive bagging work whenever hey were not engaged on dusting and other work and large numbers of hoppers were destroyed in this manner.

(*d*) *A New Hopper Trap.*—A small hand-cart-like contrivance combining the advantages of both hopper dozer and grasshopper bag was got made in 1941 and tried extensively during that season. It consisted of a triangular base-board (all except 1″ edge all round cut away) with a curved, sloping roof, mounted on a pair of small tricycle wheels in front and having a handle behind. To the triangular gap in the base-board was fitted the mouth of a small grasshopper bag, the narrow closed end of which trailed behind, when the machine was in use. Being light and equipped with wheels, it could be pushed about easily on field or bund. Taking into consideration the fact that its width is about only half that of the bag or the hopper dozer and only one man is needed to operate it. (as against two for the others) the efficiency of this contrivance is greater than that of the hopper dozer or the grasshopper bag. Its best performance was on a low crop, like groundnut.

Conclusion

It is not possible to state at this stage, why 1941 and 1942 were years of a comparatively mild outbreak; it may be that owing to poor and delayed rainfall, proper hatching did not occur, the bulk of eggs in the soil having got desiccated and killed. It is also likely that the present season (1943) is actually the first year of severe incidence in this cycle. The monsoon has started early this year and good rainfall has been received already in all the grasshopper areas and hatching of hoppers has begun in many places. Arrangements are being made to control the pest, in whatever degree it may break out.

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Observations on the Yield of Milk in Amrithmahal Cows

By M. Krishna Sastri, B.A., I.D.D., Assoc.I.D.D.

Among the Indian draught breeds of cattle the Mysore Amrithmahal breed is unsurpassed for its speed and power of endurance.

From centuries, the Amrithmahal cattle was reared and maintained by a class of professionally skilled breeders in an open system of grazing, under the patronage of the rulers, who provided extensive grazing and other facilities, while attempting certain organised methods to preserve and improve the breed for military purposes, having fully recognised its excellent draught qualities and the characteristic wild and unruly spirit.

It is only in recent years that regular attempts commenced to improve the milking qualities of the Amrithmahals and also measure their potential qualities, such as dairy temperament, early maturity, etc., under the domestic conditions, so that the animals are tamed for ordinary handling, to serve the needs of the raiyat. The Cattle-Breeding Station at Ajjampur was inaugurated in the year 1930, to breed the Amrithmahal cattle, deviating from the traditional breeding practices with a view to replace that old system, as far as possible, by scientific supervision and keeping of accurate records, after the modern Animal Husbandry practices, so essential for the economic improvement of this valuable breed.

Although the Amrithmahal has a reputation for poor milk yield, its response to farm conditions of careful feeding and management, indicate its remarkable potentialities of which the following are significant.

Maturity and Breeding

Being bred under the ranching conditions, for generations, the females in the ranch herds are rather late maturing. As a general rule, they drop their first calves at about six years of age. Under farm bred conditions the females have dropped calves at the age of three to four years. About 30 per cent. of the herd calve at an average calving interval of twenty months—a factor of considerable economic importance in breeding.

The table above indicates some of the remarkable average performances of the Amrithmahal cows, at the Cattle Breeding Station, Ajjampur. The figures indicate, however, the progressive work with regard to the milking qualities possessed by the Amrithmahal cows and support the fact, that if feeding, breeding and weeding are done carefully, on scientific lines, the Amrithmahal cows fairly compare with, if not surpass, the milk-yielding capacities of the other draught breeds of India, either in quality or quantity of milk, without sacrifice of the draught qualities, so characteristic of the breed. It is to be remembered that the calves are not weaned, while considering the lactation performances, which are of good standard, to the breed in question. The overall average of the milking herd was 2.7 pounds (1930-31) when the Station was established

Milk Performance

Average age of cow in years	Average milk yield during lactation in pounds	Average number of days in milk	Average number of days dry	Average daily milk yield during lactation in pounds	Average calving interval in days
3	2127	443	141	4·9	584
4	2473	458	262	5·4	720
5	2569	443	274	5·8	717
6	2329	613	130	3·8	743
7	2492	445	239	5·6	684
8	2071	417	243	5·1	660
9	2412	536	277	4·5	813
10	2383	557	276	4·1	833
11	2464	320	222	7·7	542
12	1650	366	308	4·7	674
13	1942	353	222	5·5	575
14	1890	402	188	4·7	590
15	1699	472	149	3·8	621

as compared with 5.3 pounds during 1939-40. It may be stated that till very recently in the breeding of Amrithmahal cattle, generally, attention to the milk-yielding qualities, were rather neglected and authentic records of milk performance were wanting.

Thriftiness

From the standpoint of the remarkable longevity of the Amrithmahal cow for over fifteen years, and considering her entire life-cycle, it may be stated that her economic productive period—*i.e.*, fecundity and fairly uniform milk yield during lactations—is perhaps unique in addition to the features of hardiness of constitution and general immunity to diseases. Many instances are on record to be cited: A cow born in 1926 dropped eleven calves in fourteen years of her life and she is still quite thrifty in condition and performance.

The Amrithmahal breed can be classed as the best of the Indian draught breeds, having sufficient milk to rear healthy calves and a surplus to spare.

"As a general rule to be followed in the breeding of draught cattle, the milking qualities should be encouraged, so far as they are entirely consistent with the maintenance of essential qualities which good draught cattle should possess. The improvement of cattle is a slow and difficult process and the more definite the aim, the greater the chances of success." The standard type of the cow to suit the average Mysore raiyat should be one capable of rearing a healthy and strong calf and in addition, produce about 1,500 pounds of milk during a lactation period for his domestic use. Many of the Amrithmahal cows measure to the above standard, and even surpass the mark.

A Ratoon Crop of Paddy

Mr. Channaboregowda of Bendiganahally has communicated his experience:—

"I bought thirty seers of S. 684 paddy seed from the Agricultural Depot at Hoskote and raised the nursery in a three-gunta (3/40 of an acre) plot. It was manured with three cartloads of farmyard manure and sown with seed on 25th July 1942. On 25th August 1942, the month-old seedlings were transplanted in an area of 1 acre and 20 guntas.

This field of one and a half acres was ploughed and puddled four times, once in a week. A day before transplanting, ten cartloads of *hongey* leaf was incorporated into the soil, which was also manured with 750 lbs. of groundnut oil cake. After transplanting, the plot was irrigated regularly and weeded twice. Earheads began to appear in November 1942, and the harvest was taken in January 1943. The yield was 41 pallas of paddy and 8 cartloads of straw.

As there was water in the plot the stubbles began to throw shoots again. A ratoon crop was then considered possible and the plot was, therefore, weeded and irrigated regularly. After fifty days of cutting the first crop, earheads appeared in the ratoon. The crop grew to 3 feet height. It was harvested on 8th May 1943, and yielded 14½ pallas of paddy and 3 cartloads of straw—966.6 seers of paddy and 1 $^{1}/_{3}$ cartloads of straw to the acre.

A ratoon crop of a smaller quantity was obtained in six acres around my field. Thus it seemed quite feasible to secure from the ratoon a crop equal to about one-third of the first crop."

The Agricultural Inspector, Hoskote, writes that the extra cost involved in taking the ratoon crop was only that of one weeding, amounting to Rs. 5-10-0 (15 women at 6 annas per day).

The Paddy Special Officer observes that this might have been due to the supply of water and heavy manuring and it would be interesting to try the experiment in more number of places.

SELECTIONS

"Grow More Food" Drive in Mysore

Recent developments in the war situation in the East have given rise to many new problems in India. The most important of these refers to the problem relating to the supply of adequate quantities of essential foodstuffs to the people. This problem is being tackled in Mysore in two ways, first, by a scheme of comprehensive control and rationing of essential commodities and, secondly, by an energetic drive for increasing the production of foodstuffs in the State. In regard to the latter, earnest efforts are being made by the Government of Mysore to increase food production not only by offering suitable concessions to secure that every available acre of fresh land is brought under the plough but also by encouraging intensive cultivation, *i.e.*, by encouraging the growth of "two blades of grass where only one grew before".

Even before the pressure of recent events enjoined the need for the adoption of immediate measures to augment food production, Government had long been keenly alive to the problem of making the State normally self-sufficient in the matter of food supply, particularly in regard to the rice and pulses.

As early as January 1941, Government sanctioned the proposals of the Director of Agriculture for the adoption of special measures for increasing the production of paddy in the State in a number of Taluks and made large grants for subvention farms and demonstration plots. The scheme contemplates the gradual decrease of the annual import of paddy by a five-year programme for the extension of improved varieties of paddy.

These measures are in the nature of long-term measures but the importance of stimulating increased production to meet the urgent needs of the present situation has not been overlooked. It is the desire of Government that as large an extent as possible of unoccupied irrigable lands in the State should be cultivated with paddy and to this end they have offered various concessions. The normal procedure for the disposal of *darkhasts* has been simplified to minimise delay in the grant of lands. Deputy Commissioners have been empowered to lease out unoccupied irrigable lands under channels and tanks for temporary paddy cultivation for a period not exceeding three years. Such lands will be free of assessment in the first year and be subject to only half assessment in the second and third years. The raiyats, who bring these lands under cultivation, will further have the option of purchasing them for a reasonable upset price on the expiry of the period of their lease. In the case of marshy lands, the assessment will be waived provided the lands do not use channel water directly.

Government have also sanctioned further liberal concessions to be in operation for a period of two years. These are:—

(1) Stocking by the Agricultural Department of adequate quantities of seed paddy, ragi and jola of improved strains to be distributed for *bonafide* agricultural purposes at cost price, transport and other incidental charges being met by Government.

(2) Supply of manure at 75 per cent. of the cost price; transport and other incidental charges being also borne by Government.

(3) Loan of departmental tractors to the raiyats for ploughing purposes at a concession rate of Rs. 4 per acre.

(4) Reduction of the rate of interest on the *Takavi* loans granted in connection with the "Grow More Food" scheme to 3½ per cent. The interest

itself will be waived if the advance is repaid promptly and regularly. In response to the popular demand voiced in the Representative Assembly and the Legislative Council for an enhancement of the provision for *Takavi* loans, Government have increased the current year's provision of Rs. 75,000 to Rs. 5 lakhs and Departmental officers have been instructed to dispose of applications for loans with the greatest expedition.

(5) Arrangements have been made for the manufacture of agricultural implements in the Government Industrial Workshop, the Mysore Implements Factory, Hassan, and the Mysore Iron and Steel Works, Bhadravati, for stocking them in the Agricultural Depots and for their supply to certified agriculturists at a nominal profit of 2 per cent. over cost price to cover the handling charges.

In view of the insufficiency of the supply of grains and pulses in the State, Government have directed that the concessions in regard to assessment sanctioned in respect of lands granted under the "Grow More Food" scheme should be extended to lands on which pulses are grown.

Government have also instructed the District Officers to investigate the cause of the existence of fallow tracts in the occupied lands in the State, the extent of such fallow tracts ranging from 6.5 per cent. in the Mandya District to as much as 28.7 per cent. in the Shimoga District. Deputy Commissioners of Districts have been requested to report on the steps to be taken and the inducements to be offered in order to bring as much of the current fallows as possible under cultivation.

Additional staff, including a Special Officer, who will be in charge of all measures relating to this campaign, at a cost of over Rs. 21,000 per annum has also been sanctioned.

A scheme for increasing paddy cultivation in the Irwin Canal area has been sanctioned. The estimated area under paddy in this tract is about 35,000 acres, comprising 27,000 acres in the paddy block and 8,000 acres in blocks other than sugarcane. Of this area improved seed has been issued to 20,000 acres for increasing production of paddy by about 20 per cent. and manure to 10,000 acres. The expenditure on this account is estimated at Rs. 50,000 for the purchase of paddy and at Rs. 1,00,000 for the purchase of manure. Nearly 14,000 acres of dry land have been brought under cultivation under the new distributaries in Malavalli Taluk and under the Shimsha Branch in Mandya Taluk. An intensive campaign is being carried on for promoting paddy cultivation in these new areas and seed and manure will be distributed for rice cultivation at 25 per cent. below cost price.

The dry zone of village reserves in the Irwin Canal area having been extended, about 10,000 acres of irrigated land will now be converted into dry. The local officers have been instructed to see that this area is fully utilised for the cultivation of ragi and other food crops. The levy of dry assessment on these lands will be waived for two years where they are actually used for raising full crops. The recession in the water-spread area of Krishnarajasagar has caused an area of 5,000 acres to become available for ragi cultivation. As a special concession this year, raiyats of neighbouring villages will be allowed to raise ragi on these lands without previous permission. The lands so cultivated will be subject to the payment of a nominal assessment of annas eight per acre. The beds of breached tanks in the Irwin Canal area have been made available for temporary cultivation and applications for the occupation of these lands are being granted on a three-year tenure which could be extended, in special cases, to five years. No assessment will be charged in the first year and only half assessment in the second and third years. Jola and vegetable seeds will be supplied to holders of these lands at half the cost price, and in deserving cases, without any charge at all.

As regards other irrigation works such as Marconahalli, Bhadra and Anjanapur reservoirs and the bigger tanks, it is estimated that additional

unoccupied lands to the extent of over 5,000 acres will be brought under paddy as a result of the concessions offered by Government. In addition to unoccupied irrigable lands, there are large areas comprising assessed waste, surrendered Amrithmahal Kavals, Date Reserves and disafforested areas which could be and are being taken up for cultivation. In order to encourage the utilisation of these lands for the cultivation of food crops, concessions similar to those offered in the case of unoccupied irrigable lands have been granted.

It is gathered from the returns received from the several districts of the State that an extent of over 172,000 acres of land has been granted for cultivation under the "Grow More Food" scheme, but that only a third of this area has actually been brought under cultivation so far. A large extent could not be brought under the plough owing to unfavourable seasonal conditions and other causes.

The success of a "Grow More Food" Campaign like the one which has been undertaken in the State will, of course, depend much on the extent of co-operation that is forthcoming from the public. Without adequate response from the people, any scheme of increased food production would not be attended with satisfactory results. It is the object of this general account of the steps that have been and are being taken by Government to stimulate and increase food production in the State, to direct public attention again to the imperative need and urgency of securing further substantial progress in this direction. The drive has yielded good results in some places, while in other places much more has yet to be achieved. There are yet thousands of acres of cultivable land in the districts to be brought under the plough, especially now when we need badly to augment our existing food stocks. So far as Government are concerned, this work of augmenting food production will be pushed on with thoroughness and energy but the people have also a part, indeed a considerable part, to play in this matter.

It is hoped that the agriculturists of the State will take full advantage of the very substantial concessions offered by Government and see that Mysore sets the pace for other parts of India in regard to growing more food, as it has done in many an other field of political and social activity.

—*Mysore Information Bulletin,* Vol. VI, No. 7, July 1943.

Substitutes for Rice

Bajra, jowar, maize and barley are four food-grains habitually used in normal bazaar practice for admixing with ordinary wheat *atta*. Experience shows that upwards of 20 per cent. admixture of any of these grains, either singly or in combination, does not detract from the edible qualities of the resulting *atta* and make no appreciable or even noticeable effect on the taste. The most common practice is to mix barley meal with wheat *atta*; a practice that is fairly extensive in ordinary civil consumption and is to-day being practised in the manufacture of wheat flour in the United Kingdom. Maize is frequently used for the same purpose but the limitation to its use with wheat *atta* is that, it naturally tends to change the colour and gives the *atta* a reddish tinge. It is the same consideration that normally dissuades the trader from mixing either jowar or bajra with wheat *atta* as both of these tend to give the *atta* darker tinge.

But bajra, jowar and maize are frequently and extensively used, particularly among the agricultural and rural communities of North India and elsewhere, to produce an *atta* ground from one grain alone. Indeed, many people eat a certain proportion of bajra as a matter of sentiment or tradition. For example, His late Highness the Maharaja of Bikaner at every meal first ate a bajra chapati before eating others made of wheat.

The preparation of the coarser grains for cooking requires that they be ground in some form of mill just in the same way as wheat is ground. Almost exclusively these coarse grains are ground on the domestic grind-stone which, in India, is known as a hand *chakki*. This consists of an upper stone that is rotated by hand on a lower stationary stone of the same size. The two stones are usually about 18 to 24 inches in diameter and from 4 to 6 inches in thickness. From the bottom stationary stone there protrudes a wooden pivot, about 1½ inches in thickness and on this and through a central hole the upper stone is placed. The upper stone has a handle on its outer edge for rotation purposes. On a grind-stone like this any of the coarse grains can be ground to any consistency varying from a rather coarse meal up to, but short of, the finest flour. In many parts of India mechanically driven stone mills are to be found in the bazaars and the urban public frequently take their grains to such places for grinding.

The following are a few points concerning the preparation of these grains for consumption:—

Bajra.—This food-grain is generally consumed in the winter season as there is a general impression among the public that it is unsuitable for use in the hot weather; a belief rather than a fact. It is more commonly employed in the preparation of *chapaties* than in any other form. The flour or meal is first mixed with a little warm water and is kneaded into the consistency of dough. At this stage salt to taste may be added. The dough is then separated into suitable quantities sufficient to make *chapaties* of the required size. The *chapaties* are almost entirely made by manual methods and it is rare that their preparation entails their being rolled on boards covered with a sprinkling of flour such as happens when making wheat (*atta*) *chapaties*. The *chapati* when prepared is of the normal shape or size, *i.e.*, a circular piece of dough of varying diameters from a few inches to 12 inches or 18 inches and of the thickness the consumer appreciates. In dough form the thickness is usually about one-eighth of an inch or slightly less. The dough *chapati* is baked on an iron girdle over a fire of moderate heat. When cooked, it may be spread with ghee or with pulses or with curry and then it is ready to eat. It is important to note that the finer the flour ground from bajra is, the better it is to the palate. It must be remembered that bajra flour does not keep for long and will lose its "life" or elasticity if it is kept for more than ten days or thereabouts. In other words more than ten days' requirements should not be ground at any time.

Bajra is also used in the well-known preparation called *Kichery* or *Kedgeree*. In this preparation, bajra is only lightly ground. Pulses are added (*Moong* frequently) and the whole placed in sufficient water to cover and boiled until tender. Occasionally rice may also be boiled together with the mixture of bajra and pulses. Salt is added to taste. Generally, this preparation is made in the evening and kept overnight; it is eaten in the morning with curds or butter and ghee.

Another method of eating bajra in Northern India is for the grains to be very lightly ground, then mixed with water, as required, and boiled. Too much water is not necessary as the object is to make the bajra into a kind of dough. After cooling, the dough is made up into small balls which are eaten with pulses or lentil curry.

A further method of eating bajra consists in making *chapaties* which are then broken up into small pieces mixed with ghee and *gur* and then rolled into balls. A good deal of ghee is necessary for this preparation in order to give it the proper consistency. In Northern India this preparation is known as *Churma*.

Parched bajra is another food. The parching operation varies according to the skill or experience of the cook but the process is a simple one in all essentials. Sand, which has previously been heated to a high temperature, is

poured into an iron pan over a fire. Sometimes an earthen vessel is used. The bajra after having been thoroughly cleaned is thrown into the pan and rapidly stirred into the hot sand with a long-handled laddle. As soon as the bajra begins to crackle and swell, the contents of the pan are run off and the sand and parched bajra are separated by seiving. Parched bajra may be eaten with or without sugar like parched rice.

Jowar.—Unlike bajra, jowar is used almost exclusively in the preparation of *chapaties*. The grain is reduced to a meal or flour in the same manner as bajra or wheat and the product is kneaded with warm water, as required, and ultimately baked into *chapaties*. Frequently, jowar *atta* is used in combination with wheat *atta* or bajra meal.

Another way of using jowar is this. The grain with husk is soaked in water overnight and eaten in the morning, when fully steeped, either by itself or with sugar. A third way is for the grain with husk to be boiled in water or milk for forty minutes or so, and when sufficiently soft it can be eaten with or without sugar.

Maize.—When the maize has been harvested, fully matured grains are removed from the cobs and ultimately ground into *atta* or meal in the same way that it has been described for bajra. *Chapaties* are made from maize *atta* in exactly the same way as from wheat *atta,* etc.

Maize is also consumed as a parched product made in the same way as parched bajra or parched rice. In some cases the parched maize may be ground into flour to which water is added, converting the mixture into a kind of porridge, eaten generally in the morning. Milk may also be added to taste. This preparation is known as *Sattu* and is very popular in the United Provinces and Bihar.

Kichery (*Kedgeree*) may also be made out of maize in the same way as from bajra or pulses.

Barley.—This is seldom, if ever, used alone and in the manner indicated for the three grains above. Its primary use, as indicated in paragraph one above, is as an admixture with wheat *atta* or, as the trade more gracefully states, for the sophistication of wheat *atta.*

Name	Moisture per cent.	Protein per cent.	Fat (Ether Extractives) per cent.	Mineral matter per cent.	Fibre per cent.	Carbohydrates per cent.	Calcium (Ca) per cent.	Phosphorus (P) per cent.	Iron (Fe) mg. per cent.	Calorific value per 100 gm.	Carotene (International Vitamin A units per 100 gm.)	Vitamin B_1 (International units per 100 gm.)	Calories per oz.
Bajra (or Cambu)	12·4	11·6	5·0	2·7	1·2	67·1	0·05	0·35	8·8	360	220	110	102
Jowar (or Cholam)	11·9	10·4	1·9	1·8	..	74·0	0·03	0·28	6·2	355	136	115	101
Maize, dry ..	14·9	11·1	3·6	1·5	2·7	66·2	0·01	0·33	2·1	342	..	..	97
Rice raw, milled	13·0	6·9	0·4	0·5	..	79·2	0·01	0·11	1·0	348	..	20	99
Wheat, whole .	12·8	11·8	1·5	1·5	1·2	71·2	0·05	0·35	5·3	346	108	180	98

—*Mysore Information Bulletin,* Vol. VI, No. 6, June 1943.

Jack Fruit Seed

Jack fruit seeds are undoubtedly a useful source of a food reserve. An analysis of the seeds given by A. W. R. Joachim and D. G. Panditteseker in the *Tropical Agriculturist,* Vol. XC, 1938, shows the following composition:—

Moisture	52·10%
Protein	4·62%
Carbohydrate	41·20%
Ether extract (fat)	0·66%
Fibre	0·16%
Mineral matter	1·26%
Calorific value per 100 g.	189·2 %

It is pointed out that the dried seeds have a composition similar to that of rice.

It is reported by Watt that the roasted seeds taste not unlike chesnuts, which suggests an edibility considerably in excess of that usually attributed to them by Europeans.

I am not aware of any experiments on the conversion of jack fruit seeds into flour, but there seems no reason why this could not be done.

—W. W. M., *The Planters' Chronicle,* Vol. XXXVIII, No. 14, July 3, 1943.

United Nations Food Conference

The work of the Conference was divided into four sections, and each section was subdivided into committees. There were as many as twelve such committees, to say nothing of numerous sub-committees in operation. In addition to being represented on all sections and committees, India was assigned a seat on the Steering Committee of the Conference and the Vice-Presidentship of one of the committees.

As was to be expected, the Conference put supply of food of the right quality and in sufficient quantity to the peoples of the world in the forefront of its recommendations. The science of nutrition has already done a great deal to reveal the evils of deficient diets and suggested remedies for their cure. India's record in this field of investigation is high, and many attending delegates probably learned of it, for the first time, at the Conference. But, as India has already come to realise from experience, research is not enough; the lessons of laboratory and field have to be translated into increased production of the right kinds of food and increased purchasing capacity for those who need them.

A whole series of valuable recommendations were, therefore, devoted to practical measures for nutrition, increasing of output by proper methods, use of machinery and fertilizers, soil conservation, irrigation and cultivation of new areas. The need for the provision, on easy terms, of equipment and other material needed to improve production and for the manufacture of agricultural machinery in those agricultural countries which can do so, was stressed.

The Conference was not empowered to commit the participating Governments to any course of action on the matters that came within its purview. It could only make recommendations. It could only define objectives and indicate in general terms the methods of achieving them. Foremost amongst its aims was the achievement of united endeavour to secure freedom from want.

In the words of Sir Girja Shankar Bajpai, "For the first time perhaps in the world's history, significant concerted action among nations to make the

earth yield more of its fruits for the benefit of mankind received solemn international affirmation. For the first time, the creation in the field of food and agriculture of an international organisation, competent to study all its problems, scientific, economic, in co-operation with national or international organisations in related fields, has been recommended with impressive unanimity.

The principle of expanding world economy has been given preference over certain policies of planned scarcity which had some favour during the past two decades. The value of industrial development in populous countries which are now predominantly agricultural, as an aid to the economic prosperity of the world, has been recognised. These are not insignificant landmarks in the history of international co-operation."

—*Indian Information,* Vol. 13, No. 117, July 1, 1943.

British County War Agricultural Committees

On August 25, 1939, the Emergency Defence Powers legislation or the Defence Regulations of 1939 became effective. In the first paragraph of Section 66 of this document, also known as S.R. and O., 1939, No. 927, a definite statement of the powers delegated to the county war agricultural executive committees is given as follows: "The Minister of Agriculture and Fisheries may by order provide for delegating to such extent and subject to such restrictions as may be specified in the order, to any person or body of persons appointed or approved by him, all or any of his functions," such as preservation of agricultural land, control of cultivation and termination of agricultural tenancies, killing of rabbits, pests or game (for the purpose of minimising injuries to crops and pastures and increasing the supply of food in the United Kingdom). "Any such order may contain such provisions as the Minister thinks proper with respect to other incidental and supplementary matters."

These Committees were first appointed by the Minister of Agriculture and Fisheries for England and Wales and were known as the War Agricultural Executive Committees and limited to a membership of seven individuals in each county chosen from members of such bodies as the County Councils, the National Farmers' Union, the Women's Land Army and similar agricultural groups plus the assignment to each committee of an executive advisory officer, generally the county agricultural official or organiser. These have been given much wired powers than the ordinary county agricultural committees which were existent in Great Britain during peace-time, and for all practical purposes have ceased to function during the war emergency.

While the Minister of Agriculture retained general control of the committees, from the time the war began in September 1939, these organisations were given as free a hand as possible to get on with the job of converting millions of acres of uncultivated and waste lands to a state of productiveness. The members of these committees are generally residents of the county in which they serve and possess a wealth of local agricultural knowledge and experience to guide them in their decisions in the exercise of their delegated powers.

Functioning of Committees

Each county war agricultural committee in Great Britain functions as a service organisation to an average of from 5,000 to 6,000 farmers per county. A conservative estimate of the cost to the British Government of maintenance of one of these committees over a period of one year is thought to be in the neighbourhood of £25,000. This amount represents salary payments to administrative officers, members of technical staffs and general office personnel responsible for the direction of operations of central executive committees, district committees

and sub-committees, as well as the necessary travelling expenses of some seventy persons in each county contributing their services to the committees on a voluntary basis.

The duties which fall under the jurisdiction of the committees are: (1) Preservation and maintenance of agricultural land for the production of food, (2) control of cultivation, management and use of land in order to secure maximum production of food from the farms (this control is based on special statutory orders of the Government enacted through the Ministry of Agriculture), (3) termination of any tenancy of agricultural land if it is deemed that the land is badly cultivated and not producing to the best of its capacity, (4) instruction of farmers in the most successful measures to be employed for the destruction of birds, rabbits, deer, vermin and pests which are harmful to crops.

Direction of Production

Just prior to the advent of the war in the majority of the localities of Great Britain, county sub-committees and individual rural district sub-committees were appointed to deal with each specific duty entrusted to the executive committees in the promotion of the production campaign. In general the problems dealt with by these sub-committees and their classification headings are:—

Production.—(*a*) Organisation of an extensive plow-up campaign under compulsory powers, (*b*) direction of cultivations, (*c*) cropping, (*d*) management and use of the land to assure maximum production of crops and stock.

Labour.—(*a*) Creation of a reserve of farm labour, (*b*) placing of "reserves"—including members of the Women's Land Army—on the farms.

Machinery.—(*a*) Arrangements for the supply and use of farm machinery, tractors and implements held in reserve against an emergency.

Livestock and Feedstuffs.—(*a*) Supervision of the supply of feedstuffs from merchants to farmers, (*b*) examination and approval of each farmer's requirements, (*c*) control of supplies of seeds, fertilizers, and other farmers' requisites in which there are apt to be shortages.

Drainage.—(*a*) Soil conservation measures to be adopted in regions subject to flooding, (*b*) conversion of swamp and marsh lands to arable areas through proper drainage operations.

Insects and Pests.—(*a*) Advice to farmers on the control of pests, and arrangements for supplying farmers with insecticides and fungicides.

Horticulture.—(*a*) Sponsorship of programmes for a greater utilisation of land, and the advocation of the growth of food crops in preference to the production of flowers.

On May 3, 1939, the British Government announced the payment of a subsidy of £2 per acre for all grassland ploughed between that time and the end of September of that year. With the outbreak of war in September, the ploughing-up payments to farmers were extended to include "the ploughing up of land in any subsequent year falling wholly or partly within the war period" as it applies to the specifications of the original legislation enacted in 1939. In the actual operation of the plough-up campaign cases arose where farmers were unable to finance themselves to meet the immediate costs incurred in land cultivations, and as a result arrangements were made by the Government in December 1939 to extend the powers of the county war agricultural executive committees to undertake the financing of the cultivation of the land for the farmers, later recovering the costs from the Government subsidy payments or from returns realised from the sale of the harvested crops.

As an assurance of a maximum agricultural production of food and feedstuffs for the 1941 season, a national survey was conducted by the county war

agricultural executive committees to be used as a guide in the possible reorganisation of the management of individual farms to further the national interest. The survey consisted of a classification of farms as to their productive capacity in order to determine what changes might need to be made in farm management, employment of additional labour, reclamation of land, or other factors which would increase food production.

Distribution of Agricultural Machinery

Another important function of the county war committees has been the supervision of agricultural machinery and implements in an attempt to equalise in so far as possible the distribution of machinery on the basis of the acreage to be ploughed, the use of existing tractors on the farms to the fullest extent of their capacity, and the utilisation of machinery contractors. In working out these programmes most of the counties have established machinery sub-committees and appointed a machinery officer to assist in the work. When all efforts to maintain farmer co-operation in the use of machinery fail, the committees are required by the Ministry of Agriculture to undertake the farm work themselves with the use of governmentally-owned tractors and other implements.

Two machinery rationing schemes under the direction of these local organisations have come into being within the last few months. Since October 1941 any farmer wishing to buy an implement or tractor imported from either Canada or the United States has had to secure the approval of the county war agricultural executive committee in the county of his residence. Beginning February 1, 1942, this same control has been extended to include British-made tractor distribution to facilitate the availability of new machinery to those individuals whose need is greatest.

An added emphasis on the work of the sub-committee was noted in January 1942 when the Ministry of Agriculture announced its intention of maintaining demonstration farms in each county. This programme endeavours to teach farmers the most economical and practical methods employed to obtain the maximum agricultural crop yields. Sub-committees are given wide authority in making the arrangements for this scheme and also have the use of trained experts for demonstration purposes.

Some Results of the Work

Some idea of the progress made by these committees during the first year of the war is evidenced by the fact that in January 1940 the Government found it necessary to extend many of the powers of these agencies as originally granted under the Emergency Powers Act of 1939 to facilitate a still greater increase in arable acreage. This new legislation, the Agriculture (Miscellaneous War Provisions) Bill, endeavoured to provide the mechanism for the recovery of sums representing the increase in value of derelict or badly cultivated land of which possession was assumed by the war agricultural executive committees, and money expended either from the funds of the Ministry of Agriculture or the aforementioned committees for the purpose of enabling the land to be properly formed or of securing increased efficiency in the farming of the land.

Still further recognition of the importance of the work performed by the executive committees in each locality was reflected in a speech by the present Minister of Agriculture, Mr. R. S. Hudson, a short time after entering upon his duties, to the effect that staffs of farm institutes and many colleges were to be placed at the disposal of the county committees to aid in the new food production campaign. "Such help as these staffs can give will be required by the war agricultural committees who are being charged with the immediate duty of finding out how production can be still further increased on every one of the

existing 300,000 farms, and what will be needed to make this production possible—whether it is drainage, fertilizers, or machinery."

In the effort to achieve the 1941 agricultural production goals a new agricultural measure, the Agriculture (Miscellaneous War Provisions) No. 2 Bill, was introduced into the House of Commons. This measure was very important from the view-point of its land drainage grants. Previous legislation, the 1940 No. 1 Bill, to which reference has already been made, provided grants for mole drainage only, whereas the new law enabled the Government to make grants for schemes providing field drainage and cleansing or other improvement of ditches on any agricultural land on which it might be considered necessary that this action be taken to facilitate a greater production of agricultural commodities. Actual administration of this law was to be handled through the county war agricultural executive committees' approval of all drainage projects. In addition, this Act also provided for the construction of hard roads in the fenland areas, authorising the county committees to supervise and manage the actual work in accordance to plans recommended by the Ministry of Agriculture.

Wartime production results in the United Kingdom during the last three years are proof of the worthwhile accomplishments which have been realised through the county committee programme. Most British farmers have recognised the necessity of some form of control as a stimulus and encouragement for better farming and are apparently anxious that county executive committees in some advisory capacity should be continued to be maintained in the post-war period.

—*Foreign Agriculture,* Vol. 6, No. 11, November 1942.

Leicestershire School Children Help the Farmers

The work of growing more food and garnering harvests is vital to our war effort. Many thousands of inexperienced people "lent a hand" last year and amongst these school children deserve special mention. Quite apart from its national importance, the work provided a valuable addition to the ordinary school curriculum and the children felt that they were performing a task with an obvious purpose. In addition, it has been shown to be possible for this assistance to be organised in such a way that the normal school life of the children suffers the minimum interference.

Improved Organisation in 1942

I should like to draw a comparison between the years 1941 and 1942. So great was the help given to Leicestershire farmers during 1941 by school teachers and school children in both city and county, that it was freely admitted by the War Agricultural Executive Committee and the National Farmers' Union that without it the potato crop in the county would never have been gathered. It was not until the end of December, however, that the potato harvest was completed, and it was generally agreed that it had taken far too long. Further, the work had interfered very considerably with the school life of the children; and in some cases there had been exploitation of the children by parents and farmers, both in hours of labour and wages paid. Another point was that the bulk of the work fell on the children in rural areas. Obviously this state of affairs was unsatisfactory to all concerned.

In the spring of 1942 it was made known that the labour requirements of the county would be greater than ever before, and the honorary Labour Organiser for the county approached Mr. W. A. Brockington, C.B.E., the Director of Education for Leicestershire, and Mr. H. S. Magnay, M.A., the Director of Education for the City of Leicestershire, to secure support and

co-operation in an organised scheme for the employment of school children on the land. After reviewing the scheme, the two education authorities promised their whole-hearted assistance.

There were many difficulties to overcome. The Board of Education fixed the maximum number of half-day exemptions for the year at twenty; the city and county education authorities would only allow children over twelve years of age to be employed; and they also defined the types of employment for which term-time exemptions could be granted. These were:—

Potato setting	..	April 15 to May 15
Singling and hoeing	..	June 1 to June 20
Pea picking	..	June 20 to July 20
Potato lifting	..	October 1 to November 15

Organisation of Labour

The head-teachers of all secondary schools and senior elementary schools were asked to undertake propaganda work in their schools, and endeavour to obtain as many volunteers as possible with the parents' consent. The response in both city and county was magnificent, and girls volunteered as readily as boys. The school returns showed that there was a pool of over 7,000 children from which to draw.

The machinery set up to control the flow of labour from school to farm was simple. The War Agricultural Executive Committee organisation is divided into eight districts, each with its District Sub-Committee and Chief Officer. All the secondary schools and senior elementary schools in each of these districts were grouped in one working unit which undertook to supply, as far as possible, all the needs of the farmers in their area. One headmaster, designated the "District Headmaster", was appointed to each group of schools; his chief duty was to allocate to each school the work which he wanted it to do. In this way it was possible to spread the work evenly over the whole area, and no school was called upon to do more than its share. All farmers requiring help from school children made their applications to the Chief Officer of the district, who vetted the requests and satisfied himself that the number of children asked for was reasonable. He then passed on the applications to the District Headmaster, who decided which school should be asked to supply the labour. In this way equality of withdrawals during term time was assured.

No difficulty was experienced in meeting the demands of the farmers during the first half of the year. The number of children available was so large that it was possible to satisfy all needs without calling upon any child to lose more than five days' schooling. The number of children employed up to the end of July was:

Potato setting	..	1,650
Singling and hoeing	..	750
Pea picking	..	600

Potato Harvest.—The really big job of work was getting in the potato harvest. This called for a maximum effort. When the estimated requirements of the farmers were considered, it was at once realized that they could not be met out of the number of exemptions still available. The Leicestershire Education Authority, therefore, decided to stagger the summer holidays for all elementary schools. By giving a shortened holiday in August, it was possible to close for three weeks during October.

The City of Leicester Education Authority was unable, for very good reasons, to alter its normal holiday arrangements, and its schools were in session during October. This proved to be a blessing in disguise, for it was possible to draw upon them at short notice for most of the big gangs of up to fifty children.

During the October holiday county schools arranged for all children who were willing to do so to attend school on certain days of the week, so that they could be selected for work on the farms in their neighbourhood as soon as farmers were ready for them. Throughout this holiday period, in every senior school in the county, some members of the teaching staff were on duty. They arranged working parties from day to day; visited parties at work; checked health records; and generally watched over the interests of their children. In the main the county schools provided the labour for hundreds of smaller farms, where they needed the smaller parties of between five and twenty-five. These could generally be supplied by local children, and farmers were not troubled with transport problems.

The bigger groups came from the City of Leicester, and transport from schools to farms was arranged by the War Agricultural Executive Committee. In all classes teachers accompanied the children. Altogether, over 4,000 working parties were organized, and more than 500,000 hours were recorded. The efficiency of the supervision may be judged by the pleasing fact that there was not a single serious accident.

Boys or Girls?—It was assumed that boys would be more acceptable to the farmers than girls; being physically stronger, it was expected that they would get through more work. The rates of pay reflected this view, for girls were paid slightly less per hour than boys. At first, farmers themselves showed some disappointment when they were told that they were to have girls. Before a week had passed, however, we were inundated with requests for "girls next time please". In practically every case where boys and girls worked together, the greater praise went to the girls. The general opinion was that they were not so mischievous as boys and were more conscientious. In most instances, however, farmers did actually pay the girls at the same rate as the boys; some even went so far as to make them bonus payments.

Children's Reactions.—So far as the Leicester children are concerned, I cannot do better than quote the report made by Mr. H. S. Magnay, Director of Education for Leicester.

"In 1942, for the first time, the city elementary school children joined with the city secondary school children to assist the farmers in the county. In all, the elementary school children worked 107,488 hours, and secondary school children 33,490 hours—a very great assistance to the farmers.

"All my reports show that the children not only enjoyed the ride out to the farms but also the work they did when they got there. They felt they were taking a real and active part in work of national importance at a critical time, and they have had the benefit of learning at first-hand something of the experience of the country child. They have been introduced to the countryside and no doubt have learned to love some of the beauty which the countryside offers us.

"There is no doubt that children and staffs were happy to take part in this work, and I feel that through this association of the city child with farming, the artificial distinctions between rural and urban life may tend to disappear, and the sense of a real community of interest may be strengthened.

"To the child from the poorer areas of the city, wherein visits to the country are infrequent in normal times, and where with present-day difficulties, with transport such visits never happen, this scheme of assistance in agriculture is clearly a boon. The child is happy to have the fresh experience, and is indeed learning by doing."

The rural child enjoyed no such sense of novelty. Some did the work from a sense of duty, but the majority of them really did enjoy the innovation. It was a change from school lessons, and a change of work is a holiday. Our reports show that very many country children would welcome an opportunity to do something useful during the long summer holiday. Children are never

so happy as when they are busy. Now that farming is becoming more mechanized, it offers greater attractions to the boys, and as a result of this experience many of them feel drawn to make their careers on the land.

Parents and teachers expressed their appreciation of the kindly consideration shown by farmers and their wives to the children who came to their farms. The provision of hot drinks at mid-day is but one example of many acts of kindness and understanding.

The experience of 1942 inspires confidence that even more help will be forthcoming in 1943. The only complaint we have had from parents, is that this out-door work gives the children bigger appetites than can be met by their rations!

Harvest Camps.—Elementary schools were not asked to contribute labour for the corn harvest. It was considered that the work was too heavy for children much under sixteen years of age. The County War Agricultural Executive Committee offered to set up Harvest Camps in those parts of the county where help was most urgently needed if the heads of secondary schools could find enough volunteers. There was a good response both from city and county boys' and girls' secondary schools. Twenty-two camps were established, and valuable help was given when it was required.

Agriculture and Education.—If promises are fulfilled and agriculture once more takes its rightful place in the forefront of the nation's life, many more workers on the land will be required. In this connection I suggest that the farming industry must take more interest in the children about to leave school. Really good material is there waiting to be recruited. The industry has much to offer; a healthy life; a variety of occupation seldom found in any other business; and improving economic prospects.

An approach might be made along the following lines:—

(1) Precede the labour periods with talks about the work to be done.
(2) Encourage school visits to good farms.
(3) Provide good films on agricultural topics.
(4) Set up camps similar to Harvest Camps by which boys would be given an opportunity of seeing the whole cycle of farming operations. Such camps might whet the appetite for a rural life.

Another development which I should like to see in the future would be the establishment of Junior Colleges for Agriculture, run on parallel lines to Junior Colleges of Art, Commerce, Engineering, Building, etc.

Even Greater Effort this Year.—Viewed against the background of the U-boat menace and the need to release every available ton of shipping to carry the war against the enemy, the harvest this year will be even more critical than it was in 1942. Every man, woman and child that can be spared will be required to co-operate with our farmers to ensure that there is no disparity between the yield and the harvest.

The organization set up in Leicestershire in 1942 stood the test very well. If it creaked a little here and there, it was generally due to the fact that farmers left their requests for help until the last moment; and the machinery was strained occasionally when a large number of parties had to be found at very short notice. Few alterations in the organization will be necessary to meet the anticipated increased demands this year. The teachers have found last year's experience an invaluable training for the future, and farmers may again count on their willing co-operation. The children, for their part, are more than willing to do their share, and so long as the help of the schools is required, Leicestershire farmers may rest assured that it will be forthcoming.

—*Agriculture* (Journal of the Ministry of Agriculture, Britain)
Vol. L, No. 2, May 1943.

Eastern Russian Agriculture

We are dealing here with an enormous territory, extending from the Caspian Sea and the lower and middle Volga Basin eastward to the Pacific, including, therefore, a strip of European Russia and all Asiatic Russia. Eastern Russia, as we shall call this whole territory, comprises roughly more than three-fourths of the area but contains only a third of the population of the Soviet Union. The great bulk of this vast area is east of the Volga and its tributary Kama.

It has been said with good reason that, although the Ural Mountains constitute the accepted geographical line of demarcation between European and Asiatic Russia, the Volga is actually the cultural boundary between Europe and Asia, between the West and the East, between the old and the new Russia. But the Volga may also be considered a significant agricultural boundary line, since farming conditions in the territory east of that river differ in many essential respects from those in the regions west of it.

The famous Russian historian, V. O. Kluchevsky, observed that Russia's history is a "history of a country in the process of colonization". Nowhere is this thesis illustrated better than in Eastern Russia, since its settlement has been relatively recent and beyond the Urals has in fact continued in our own day, resembling in many respects the settlement of the American West. A highly important consequence of the recent settlement and sparse population of Eastern Russia is the absence of that pressure on land which was characteristic of the much more densely populated regions, particularly the central black soil area and the Ukraine. It is reflected in larger peasant landholdings in the east under both the former individual and the present collective systems. Thus, in the central black soil Provinces (Orel, Kursk, Tambov, and Voronezh) the average area per peasant household on a collective farm in 1938 was 25 to 27 acres and in the Ukraine, 22 acres. But in the recently dissolved German Republic of Volga (which is mostly east of that river) it was nearly 82 acres; farther east in the Orenburg Province, recently renamed Chkalov, it was 96; in the Chelyabinsk Province, 99; and in Western Siberia, 116 to 121 acres. The increase in the holdings in Russia from west to east parallels in general a similar increase in the United States from east to west.

However, the Eastern Russian farmer, though better provided with land, is confronted with harsher climatic conditions, which make a larger amount of land necessary to support the family. Eastward the climate becomes more continental in character, with long, cold winters and scant precipitation as the gentle winds from the Atlantic give way to the icy breezes from the Arctic and the parching winds from the Central Asiatic deserts. Only in the Far East near the Pacific is a moderating influence on the climate exerted by the ocean.

In spite of the severe winter, the relatively warm summer permits the extension of agriculture far to the north, particularly west of the Ural Mountains in European Russia. East of the Urals in Siberia, however, the northern border-line of the agricultural zone as a rule pushes farther south, though again in spots crops are grown far north. In general, climatic factors and, closely associated with them, soil conditions confine agriculture in Western and Central Siberia largely to a relatively narrow belt of forest-steppe and steppe lands. It hugs the trans-Siberian railroad lines and is hemmed in between the vast forests (taiga) and marshes on the north and the semi-desert and mountains on the south. Farther east, in the mountainous country near the huge fresh-water Lake Baikal and in the Amur and Pacific regions, there are only scattered sections of land suitable for farming. There is a distinct agricultural region in the southern part of Asiatic Russia, in the Turkestan beyond the Caspian Sea, where agriculture is of an ancient oasis character, based primarily on irrigation.

Climatic conditions tend not only to restrict the agricultural area as a whole but also to limit the selection of crops. Winter crops, which play so important

a part in Russian agriculture west of the Volga Basin, are a case in point. Thus in the Ukraine in 1938 winter grains constituted 37 per cent. of the crop area; in the Krasnodar Province (Kuban) of North Caucasus, 40 per cent.; in the central black soil Provinces, over 30 per cent. But even the hardier rye, to say nothing of winter wheat, becomes less and less important east of the Volga. In the Bashkir Republic winter wheat occupied about 24 per cent. of the crop area; in Orenburg Province, 16 per cent., in the more eastern Chelyabinsk only 11 per cent.; and still farther east in Altai Province, less than 3 per cent. Some increase of the winter-grain area since 1938 in these regions was fostered by the Government, but the broad picture probably remains substantially unchanged.

The small proportion or absence of winter crops, with the consequent predominance of spring crops, has serious disadvantages. For one thing, it greatly increases the fieldwork load in the spring and the peak during the harvesting season. For another, by restriction to spring crops the farmer is deprived of valuable insurance crops in case of a drought, especially in view of the greater drought-resistant qualities of winter as compared with early spring grains. This is particularly important in the Russian eastern regions where agriculture is carried on to so large an extent under semi-arid conditions and where concentration on spring crops therefore increases the hazards of farming.

Aridity, then, is another serious limitation that climate imposes on agricultural activity in Eastern Russia. Practically the whole of the middle and lower Volga Basins and the agricultural belts of Kazakhstan and parts of the Ural area are in a zone of low (16 inches and less per annum) and erratic precipitation and high evaporation during the vegetation period. Scorching, dry winds from the Central Asiatic Desert, so-called sukhovei, which play havoc with the growing crops, are also frequent. As a result, devastating drought bringing crop failure in their wake are common.

The contrast in this respect between the east and the south of Russia is striking. Semi-arid conditions also prevail in a large section of the south (southern steppe Ukraine), but there this unfavourable climatic factor is offset to a considerable extent by the cropping system, in which winter grain, chiefly winter wheat, plays a leading role. On the other hand, in the eastern semi-arid area the predominance of early spring grains, especially spring wheat, makes agriculture particularly vulnerable to recurrent droughts and the crop outturn highly uncertain. This ever-present spectre of drought constitutes the most serious weakness of eastern agriculture. It is particularly fraught with danger when, as during the present war period, much greater reliance must be placed on the contribution of the eastern regions to the national food supply and when a poor crop in the Volga area cannot be offset by a good crop in South and Central Russia.

More stable yields prevail in the Siberian agricultural zone than in the Volga Kazakhstan. But because of a later season rainfall often interferes with harvest, making combine operations difficult and requiring artificial drying of the grain. In the Far East not only is lack of rainfall not a limiting factor but, on the contrary, excess moisture causes considerable damage to the grain. At the other extreme is Turkestan, the principal Russian cotton-growing area, where agriculture is for the most part impossible without irrigation.

With the exception of the cotton-growing regions of Turkestan with their intensive agriculture, Eastern Russia is characterized by extensive grain farming. Winter rye, while still important in the western part of the Volga area, is of secondary importance east of the lower and middle Volga, except in the Ural districts of Perm and Bashkir Republic. Winter wheat acreage is insignificant except in Turkestan. The leading crop, the staple of Eastern Russia, is spring wheat. It occupies from a third of sown acreage in the Volga area to a half in Western Siberia. About 80 per cent. of the Russian spring wheat acreage is concentrated in Eastern Russia, and the grain, especially

in the Volga region, is of excellent quality. Thus, although the Russians have lost through Nazi occupation much of their winter wheat and winter rye areas, they have retained the larger part of their spring wheat belt. But the yields of spring wheat are lower than those of winter wheat and rye, thus diminishing the importance of this area in the total Russian grain production. Of wheat alone, Eastern Russia accounted during 1933-35 for over a half of the total Russian output.

The grain ranking next in importance to wheat is oats, which is widely grown in Eastern Russia with the exception of Turkestan. On the other hand, outside of Turkestan relatively little barley is grown, although it has been pointed out that it is well adapted to the climatic conditions of the semi-arid zone and is especially useful under Russian conditions as a mild weed combater. The grain crop peculiar to Tnrkestan is rice, of which nearly 300,000 acres were cultivated in 1938. A larger acreage, however, was devoted to this crop ten years earlier, before rapid cotton expansion encroached on rice. There is also a very small and declining rice area in the Far East. Eastern Russia accounted during 1933-37 for over a third of the aggregate Soviet production of all grains and legumes.

There has been a substantial increase in the acreage under potatoes and vegetable crops in eastern regions in recent years. Mustard seed and sunflower seed, an important source of Russian edible vegetable oil, are cultivated in the lower Volga area mostly to the west of the Volga River. Some 240,000 acres are under soybeans in the Far East. Melons are a speciality of the lower Volga, and grapes, apricots and other fruits are grown in Turkestan. A little low-grade tobacco is grown in the lower Volga. The sugar-beet acreage is insignificant in Eastern Russia.

The outstanding industrial crop produced in the eastern regions is cotton. Just as spring wheat is the staple crop of Volga-Siberian area so cotton is the staple of Turkestan, or the so-called Central Asiatic Republics. Although cotton is also grown under irrigation in Eastern Transcaucasia and was introduced during the past decade as a dry-farming crop in North Caucasus, Southern Ukraine, and Crimea, Turkestan remains the principal cotton area of the Soviet Union, accounting for about three-fourths of the Russian production. Cotton has been grown in Turkestan under irrigation since time immemorial. After the conquest of the country by the Russians during the second half of the nineteenth century, the native inferior varieties of cotton were replaced by American types, and the growing of cotton for the needs of the important Russian textile industry, concentrated largely around Moscow, was stimulated. Rail-roads connecting the cotton-growing regions with the Caspian Sea (with a terminus at the port of Kransnovodsk on the eastern shore of the Caspian Sea) and with Moscow through Orenburg and Samara (the present Kuibyshev) were constructed before the first World War. New irrigation works were undertaken and various other measures were adopted to push cotton cultivation.

The Soviet Government, bent on attaining complete self-sufficiency in the matter of cotton supply, pursued the cotton-expansion programme even more energetically. A new railroad connecting Turkestan with Siberia provided a convenient means of supplying the cotton-growing regions with grain. The small native farming was thoroughly collectivized, not without considerable resistance of the local population, and much attention has been paid to irrigation and agricultural technique. Increased cultivation of alfalfa as a predecessor of cotton was stressed. New varieties of cotton, particularly long-staple cotton, were introduced. The Uzbek Republic with its fertile Ferghana Valley is the principal cotton-growing region in Turkestan, accounting for over 40 per cent. of Russian acreage. Altogether 3,350,000 acres were devoted to cotton in 1938 in the Central Asiatic Republics and Southern Kazakhstan. The bulk of the Russian raw cotton supply, therefore, has not been menaced by Nazi invasion as is the textile industry in the Moscow industrial region.

In addition to the fibre, the seed of cotton is a source of oil and oil-cake. Turkestan is the chief source of these products in the Soviet Union. Cotton-seed oil is the principal vegetable oil of Eastern Russia, with sunflower-seed oil next in importance. Of the Eastern Russian commercial output of 244 million pounds of all types of vegetable oil in 1934, cotton-seed oil constituted 66 per cent. and sunflower-seed oil 23 per cent. However, in the total Soviet output (820 million pounds) the proportion was reversed: namely, cotton-seed oil 24 per cent. and sunflower-seed oil 58 per cent.

Cattle and sheep farming has always been important in Eastern Russia, especially in the lower Volga and Kazakhstan with their abundant pastures. This still holds true to-day in spite of the heavy blow dealt by collectivization to animal husbandry in the early thirties, from which it had only partly recovered at the outbreak of the present war. In 1938 these regions had less than two-thirds of the cattle, approximately one-third of the sheep and goats, and about three-fourths of the hogs they had had ten years earlier. But the east still possessed 40 per cent. of all the cattle in Russia, 50 per cent. of the sheep and goats, but less than 25 per cent. of the hogs.

The most important commercial dairy regions of the Soviet Union are in Western Siberia, Northern Kazakhstan, and the Ural area. In 1934, the last year for which detailed data are available, these regions accounted for over a third of total Russian commercial butter production. Siberian butter has long been known on Western European markets. Butter exports from the Soviet Union, however, had fallen off sharply from an average of about 150 million pounds a year during 1909-13 to only about 60 million pounds a year during 1933-37.

—*Foreign Agriculture,* Vol. 6, No. 3, March 1942.

Another Milestone in Brazilian Coffee History

Brazil's coffee exports measured in tonnage have shrunk considerably since 1938 due to shortage of shipping space, and despite the recent agreement under which U.S.A. will take up their 1941-42 and 1942-43 quota—some 12 million bags costing $150 million—irrespective of whether it leaves Brazil or not, a large unsold stock must have accumulated at origin awaiting realisation. On the other hand, measured in value, the picture looks far brighter. We are indebted to the Bank of London and South America for the following comparisons:—

Calendar year	Exports Bags	Value
1942	7,279,658	£ 26,269,000
1941	11,052,484	£ 25,533,000
1938	17,112,524	£ 27,168,000

The Bank reports that the Coffee trees affected are recuperating from the effects of last winter's frosts much more quickly than anticipated a few months ago, so that the crop yields may be much larger than contemplated. Costs of coffee production are rising due to higher wages and very high prices of agricultural machinery.

Recently, Brazil reversed her coffee planting policy. After she is supposed to have destroyed nearly 78 million bags—say 4½ million tons—since 1931 for

want of outlets and while still holding large unsold stocks, she has withdrawn the previous prohibition of new planting and thereby set up another milestone in her coffee history. No reason is given for this decision so that everyone is left to draw his own conclusions, and coffee producers all the world over will do well to take timely notice of a change which may have far-reaching effects upon the whole of the world's coffee industry in course of time.

The value of Brazilian currency has steadily depreciated over a number of years from 27 pence for the milreis to roughly 3 pence, from which level there is obviously no room for a further drop. As this depreciation progressed Brazil made unprecedented strides in industrial spheres side by side with a remarkable diversification of its production of raw materials, all of which deserves our admiration. She thus became more and more independent of foreign supplies so that apart from the cost of the reduced service of her foreign debt, she had little to pay abroad. Meanwhile, the proceeds of her exports increased as the above figures indicate and accumulated in foreign currencies or in gold, while the low level of her exchange assured prosperity at home.

After a prolonged period of stability around 3*d*., Brazil then discarded the debased milreis and adopted at its final level of exchange a new currency instead. If she now permits new coffee planting again presumably she is satisfied that the elimination of her old uneconomic estates has gone far enough, and that her costs of production on modern lines are so favourable as to make her own coffee-growing industry at the exchange value of her new currency not merely remunerative again but capable of assuring her of a predominant position over other producing countries in the future.

If these assumptions were confirmed by subsequent events Brazil is not likely to hold the proverbial umbrella over other coffee producers again hereafter. She would hardly allow new planting if sacrifice quotas were all she could hold out to her growers for their new crops later on. Coffee growing is a long-term proposition and it is safe to assume that in the event of overproduction recurring some day she will be not the first but among the very last to be affected by its consequences. An additional element in her favour is the qualitative improvement of much of her output of which we read ample testimonials from different quarters. So there is every prospect that henceforth Brazil—holding most of the trumps—will enter into conferences with other coffee-producing countries very much on her own terms and that she will once again resume the role which is her due as the primary coffee producer in the world.

British Empire coffee-growers continue to enjoy a well-deserved reward for years of patient effort. They have mostly been able to sell their crops readily and well, and it is significant that some European owners of coffee estates in India are availing themselves of the present prosperity to sell their estates now. With our foregoing comments about Brazil and future uncertainties in other directions in mind this policy of selling may turn out to be wise, although money is not always the sole consideration where European settlers' homes in the Dominions and Colonies are concerned. But it certainly would be wise at all events to make provision now to ensure maximum output at minimum cost in the future. If such safeguards proved to be unnecessary later on, so much the better.

This applies to all producers and more particularly to growers of high quality crop at corresponding expense. Hitherto our own dictum in favour of this kind of production wherever possible as affording the best security in time of overproduction and price depression has been fully justified. Wartime conditions have supervened meanwhile and as long as they continue most British Empire producers may feel secure—subject to certain limitations—against foreign competition, without forgetting the artificial nature of this temporary security. Without changing our opinion we prefer to modify our dictum that fine quality is always assured of its premium by substituting "sale" for

"premium" upon the grounds that enforced economy and other circumstances may compel consumers to adopt different standards in future and to forego some of their past fancies. It may be safer to envisage conditions later on as regards coffee—particularly in Great Britain—more closely resembling the standards in other countries where good quality coffee is imported in large volume and so blended as to dispense with the need for extravagances, the merits of which disappear anyway only too frequently before they ever reach the consumers' cup. Volume will then, we hope, gradually compensate here with us in Great Britain for value just as mass production at lower cost in most other walks of life seems destined more and more to replace specialities which we knew in the past—and some of which we only really appreciated too late.

—*The Coffee Board of Kenya*, Vol. VIII, No. 93, September 1943.

BOOK REVIEW

Vyavasayada Mannugalu—'ವ್ಯವಸಾಯದ ಮಣ್ಣುಗಳು'

This is a publication by the University of Mysore, under the Sir K. P. Puttanna Chetty Trust for the publication of small books on general knowledge in Kannada language. The author, Mr. Gundappa S. Kurpad (Senior Assistant Director of Agriculture in the Mysore Agricultural Department) has, as the title of the book indicates, discussed about agricultural soils of Mysore and how to derive satisfactory benefit from them. A cogent thesis has been brought together in this concise volume of about eighty pages and one can very well call it a rural text-book. To one looking out of the agricultural window, it represents a valuable movement in Kannada literature. We want big books and small on scientific and practical subjects, which embody the observations of our own people in our surroundings. That is what the book under reference happens to be and we congratulate both the University and the author. M. V.

IN MEMORIUM

Rajasevasakta Professor B. Venkatanaranappa, who passed away on 3rd August 1943, was the Vice-President of our Union. He was on the Editorial Board of this *Magazine* and served on several agricultural committees of the Department,—Ramakrishna Krishi Sala (Agricultural School) Board and on the Agricultural Colony Committee of the Irwin Canal area. The development of scientific agriculture and popularisation of the same to ameliorate the suffering ryots were his chief desires. He felt that the institution of agricultural colonies for the educated unemployed was indeed a big stride forward in the programme of agricultural reconstruction.

Mysore knew him as an eminent Professor. For many years he taught Physics at the Central College and held the professorial chair for several years. His devotion to science was unexcelled and had the effect of inducing him to popularise science in Kannada language. For two years Professor B. Venkatanaranappa conducted a Journal in Kannada called ವಿಜ್ಞಾನ (Science). For want of financial help the publication had to be given up but the spirit behind the movement has lived. The book ಜೀವವಿಜ್ಞಾನ (Science of Life) contributed by the Professor to the University Publication Series in Kannada speaks eloquently of his love for the subject and his deep interest in the public to become scientifically and rationally minded.

To Kannadigas Professor B. Venkatanaranappa was known as an erudite scholar. The Kannada Sahitya Parishat (Kannada Literary Academy) owes a great deal to his indefatigable energy. For several years he was the Chief Editor of the Kannada-English Dictionary, a substantial piece of work sponsored by the Mysore University. The Dictionary is still being published, but as some one spontaneously expressed, he left it at the word "Perfection".

Many institutions in Bangalore—religious, co-operative, students' organizations, literary societies—have derived their inspiration from him. His daily routines were rounds of service done quietly, unostentatiously and with thoroughness. His was a towering personality and he had that sterling quality in him that is expressed in the lines "Be true to thyself and thou canst not then be false to any man".

A great soul has passed away but his spirit liveth in his monumental and other works.

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